Renvoi in Private International Law: A Formalization with Modal Contexts

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Abstract. The paper deals with the problem of formalizing the renvoi in private international law. A rule based (first-order) fragment of a multimodal logic including context modalities as well as a (simplified) notion of common knowledge is introduced. It allows context variables to occur within modalities and context names to be used as predicate arguments, providing a simple combination of meta-predicates and modal constructs. The nesting of contexts in queries is exploited in the formalization of the renvoi problem.

1. Introduction

Given an international matter (is Taro a heir of John?), one wants to decide whether the matter is valid in a given country (such as in Japan) or not. In some cases, such as when Taro's parents do not have the same nationality, this matter cannot be answered only considering the legislation of one country, and requires the determination of the jurisdiction of the matter. For instance, if there is a legal child-parent relationship between Taro and John in John's home country, the application of the law in Japan, means the application of the law in force in that country.

Private international law "enables the coexistence of multiple normative systems, having distinct and often contradictory rules" [4]. Deciding the jurisdiction over a certain case, i.e. establishing which country has the jurisdiction over that case, is only one of the different tasks which have to be considered for modeling private international law, and Dung and Sartor in [4] also consider the issue of deciding the court having competence as well as the issue of establishing the legal system according to which the court has to decide. Dung and Sartor provide an analysis of private international law and propose a formal model based on modular argumentation.

In this paper, we specifically consider the so-called *renvoi*: determining the jurisdiction in one country may require for the determination of the jurisdiction in another country, a situation which may generate a sequence of references to different countries. Renvoi is not considered in [4]. Our work is not intended to deal with normative conflicts, as done in the belief revision approaches, starting with the seminal work in [3], and in the defeasible reasoning approaches to normative conflicts [8,6,7], which usually require some kind of priority among norms to be taken into account. In particular, [7] exploit defeasible logic to deal with the problem of interpreting the foreign law in a domestic legal system, dealing with normative an interpretative gaps.

As observed by Dung and Sartor, private international law enables the coexistence of multiple normative systems having contradictory rules without the necessity of defining priorities among the rules or systems: “conflicts between competences and between rules are avoided by distributing the cases between authorities of the different normative systems (jurisdiction) and by establishing what set of norms these authorities have to apply to each given case (choice of law)”. There are only limited exceptions to this principle. This motivates our choice of dealing with scenarios, as the one introduced below, using a monotonic modal formalism, although, in the general case, a nonmonotonic formalism might be needed, such as modular argumentation in [4] and defeasible logic in [7].

Let us consider the following scenario. For simplicity, we do not consider the competence issue and assume the legal system of the country of jurisdiction is always applied.

Example 1.1 (Renvoi) Suppose the following laws hold in *every country*:

1. Inheritance matter, such as a property of heir, will be determined in jurisdiction of the home country of Descendant.
2. A legitimate child-parent relationship between Child and Parent will be determined in jurisdiction of the home country of Parent, or determined in jurisdiction of the home country of Spouse of Parent if there is a biological child-parent relationship between Child and Parent.
3. Marriage will be determined in jurisdiction of the home country of either spouse.
4. The home country is Person’s nationality, if Person has only one nationality.
5. The home country is decided by the most related country for a Person, if Person has multiple nationality.

Domestic Rules that hold in *Japan*:

1. A marriage relationship holds between Spouse 1 and Spouse 2 if there is an agreement on marriage between Spouse1 and Spouse 2 and they register their marriage in Japan.
2. Child is a heir of a Parent if there is a child-parent relationship between them.
3. Child and Parent have a child-parent relationship if there is a legitimate child-parent relationship between them, or if there is a non-legitimate child-parent relationship between them.

Furthermore, we have the following facts:

- John has multiple nationalities of Country1 and Country2.
- Yoko has a single nationality of Japan.
- John usually lives in Coutry1.
- John and Yoko agreed to get married and registered their marriage at Coutry1.
- John and Yoko had a son named Taro.

Consider the following questions:

- ’John is married with Yoko’ is valid in Japan?
- ’Taro is a heir of John’ is valid in Japan?

Motivated by the scenario above, in this paper we introduce a formalism which is the rule-based (first order) fragment of a multimodal logic including context modalities as well as a (simplified) notion of common knowledge. For instance, in the example above, legislation of Japan can be represented by a modal context while general laws (such as the jurisdiction laws), which hold in any context, exploit context variables and global facts are captured as (common) knowledge. In the simplified example we are considering, we assume a single set of jurisdiction rules rather than one for each country. The formalism is a rule based fragment of the modal language in [1], extended with context variables, and allows the interactions among contexts to be captured, context variables to occur within modalities and context names to be used as predicate arguments, thus supporting a simple combination of meta-predicates and modal constructs.

2. A modal formalization

We consider the rule-based fragment of the language in [1], extended by allowing variables to occur within modalities in rule definitions. Let $\mathscr{L}_k^\Box$ be a first order multimodal language containing: countably many variables, constants, function and predicate symbols; a finite set $Ctx = \{c_1, \ldots, c_n\}$ of constant symbols, called *contexts*; the logical connectives $\neg$, $\wedge$, $\supset$, and quantifiers $\forall$ and $\exists$, as in the predicate calculus, and the modalities $\Box$ and $[C]$, where C can be a variable or a context constant c_i in Ctx.

As the variables X occurring in a modality $[X]$ are intended to be instantiated only with constants in Ctx (as we will see later), the ground formulas of the language may contain two kinds of modalities: the modalities $[c_1], \ldots, [c_k]$, which represent k different contexts and the modality $\Box$, which can be regarded as a sort of (weak) "common knowledge" operator. A modal formula $[c_i]\alpha$ can be read as "α belongs to context c_i" or "agent c_i believes α". A modal formula $\Box\alpha$ can be read as "α holds in all contexts" or "all agents believe α".

Let A represent atomic formulas of the form $p(t_1, \ldots, t_s)$, where p a predicate symbol and $t_1, \ldots, t_s$ are terms of $\mathscr{L}$, and let $\top$ be a distinguished proposition (*true*). The syntax of the *clausal fragment* of $\mathscr{L}_k^\Box$ is the following:

$$G ::= \top \mid A \mid G_1 \wedge G_2 \mid \exists x G \mid [a_i]G \mid [X]D \mid \Box G$$
$$D ::= H \leftarrow G \mid D_1 \wedge D_2 \mid [c_i]D \mid [X]D \mid \Box D \mid \forall x D$$
$$H ::= A \mid [c_i]H \mid [X]D \mid \Box H$$

where G stands for a *goal*, D for a *clause* or *rule*, H for a *clause head*. Sequences of modalities may occur in front of goals, in front of rule heads and in front of rules. In the following D will interchangeably be regarded as a conjunction or a set of clauses (rules). A program P consists of a closed set of rules D. Also, we will adopt the convention that all the variables free in a rule D are implicitly universally quantified in front of it.

We say that a program P is *context safe* if each variable X occurring in a modality $[X]$ in a rule D of P, also occurs in an atom $context(X)$ in the body of D. We assume the predicate *context* has a built_in definition as $\forall X(context(X) \leftrightarrow (X = c_1 \vee \ldots \vee X = c_k))$, so that the context safeness condition guarantees that each context variable will be bounded to some context constant in all the possible groundings of the program P. In essence, this corresponds to a typing condition.

Referring to the example above, we can introduce the context `japan` containing the domestic rules specific to `japan`, using a Prolog-like notation, as follows:

```
□[japan] {
    heir(Child,Parent) :- child_parent_rel(Child,Parent).
    child_parent_rel(Child,Parent) :-
        legitimate_child_parent_rel(Child,Parent).
    child_parent_rel(Child,Parent) :-
        non_legitimate_child_parent_rel(Child,Parent).
```

```
marriage(Spouse1,Spouse2) :− agreement(marriage,Spouse1,Spouse2),
    registered(marriage,Spouse1,Spouse2,japan). }
```

The modality □ in front of the context modality [japan] is needed to make each context definition globally visible from all the other contexts (so that a goal [japan]G can occur in the body of any, local or global, rule in the program). Observe that non-modal atoms in the body of rules in a context can be proved either locally to the same context or using other rule definitions as those introduced below.

The following rules establish the validity of a property in some country, based on properties which may hold in the same or other countries (or globally). They are intended to capture laws (1) and (2). The modalities [CountryA] and [CountryB] can only be instantiated with the constants japan, country1 and country2:

```
(A) □[CountryA](heir(Child,Parent) :−
        context(CountryA),context(CountryB),
        home_country(Parent,CountryB)), [CountryB]heir(Child,Parent)).

(B) □[CountryA](legitimate_child_parent_rel(Child,Parent) :−
        context(CountryA),context(CountryB), home_country(Parent,CountryB),
        [CountryB]legitimate_child_parent_rel(Child,Parent)).

(C) □[CountryA](legitimate_child_parent_rel(Child,Parent) :−
        [CountryA]marriage(Parent,Spouse), home_country(Parent,CountryB),
        [CountryB]legitimate_child_parent_rel(Child,Parent),
        biological_child_parent_rel(Child,Parent)).
```

For instance, the second rule states that a legitimate child-parent relationship holds in CountryA if it holds in CountryB, where CountryB is the home country of the parent.

Global rules and facts can be encoded prefixing them with the □ operator, to mean that they are visible anywhere in the program (including contexts japan and country1):

```
□(marriage(Spouse1,Spouse2) :− marriage(Spouse2,Spouse1)).
□(home_country(Person,Country) :− single_nationality(Person,Country)).
□(home_country(Person,Country) :−
    multi_nationality(Person,Country), most_related(Person,List,Country)).
□ multi_nationality(john,[country1,country2])).
□ habitual_residence(john,country1)).
□ single_nationality(yoko,japan)).
□ bilogical_child_parent_relation(taro,john)).
□ bilogical_child_parent_relation(taro,yoko)). ...
```

We refer to [2] for a description of the Kripke semantics and of the goal directed proof procedure for this rule based language.

Let us consider, as an example, the query "is Taro a heir of John valid in Japan?", which is captured by the goal [japan]heir(taro,john). This goal succeeds from the program above, using the following instance of rule (B):

```
□([japan]legitimate_child_parent_rel(taro,john) :−
    context(japan),context(country1), home_country(john,country1),
    [country1]legitimate_child_parent_rel(taro,john)).
```

and exploiting the definition of `heir` and `child_parent_rel` from the context `japan`, the definition of `legitimate_child_parent_rel` and `marriage` from the context `country1`, and the definition of `biological_child_parent_rel`, etc. from the global facts.

3. A formalization of renvoi in private international law

The formalization of the running example given in Section 2 establishes the validity of a property in some country, based on properties which may hold in the same or other countries. For instance, in rule (A), the validity of proposition $\mathtt{heir}(\mathtt{Child},\mathtt{Parent})$ in the context `CountryA`, depends on the validity of the same property in context `CountryB`. However, the rules in the program do not make any distinction among the validity of a property in a context and the jurisdiction of the same property in that context. Introducing such a distinction is essential to capture renvoi.

In particular, to check property $\mathtt{heir}(\mathtt{taro},\mathtt{john})$ in Japan, we need first to determine the jurisdiction of the property `heir`, with Japan as applying country, using rule (A), rather than using rule for `heir` in the context `japan`. Indeed, according to law (1), an inheritance matter, such as a property of heir, is to be determined in the jurisdiction of the home country of the parent. In this example, $\mathtt{heir}(\mathtt{taro},\mathtt{john})$ is to be determined in "country1", as "country1" is the home country of John.

We then reformulate our query as $\mathtt{holds}(\mathtt{heir}(\mathtt{taro},\mathtt{john}),\mathtt{japan})$, and we can introduce for `heir`, as for every property whose jurisdiction is to be determined, a rule:

$$\begin{array}{l}\Box(\mathtt{holds}(\mathtt{heir}(\mathtt{Child},\mathtt{Parent}),\mathtt{CountryA}) :- \\ \quad [\mathtt{CountryA}]\mathtt{jurisd}(\mathtt{heir}(\mathtt{Child},\mathtt{Parent}),\mathtt{CountryB}), \\ \quad [\mathtt{CountryB}]\mathtt{heir}(\mathtt{Child},\mathtt{Parent})).\end{array}$$

where the goal $[\mathtt{CountryA}]\mathtt{jurisd}(\mathtt{Matter},\mathtt{CountryB})$ is used to determine the jurisdiction `CountryB` of the `Matter` in `CountryA` i.e., the country in which the property $\mathtt{heir}(\mathtt{Child},\mathtt{Parent})$ is to be proven.

In general, to decide the jurisdiction of a matter, we first have to determine the property involved (for instance, the matter *hair* is concerned with the property *inheritance*). The jurisdiction of a matter is then given by the jurisdiction of the corresponding property. For simplicity, we will not exemplify this aspect here. We reformulate rule (A) to determine the jurisdiction of *heir* as follows:

$$\begin{array}{l}(A)\ \Box[\mathtt{CountryA}](\mathtt{jurisd}(\mathtt{heir}(\mathtt{Child},\mathtt{Parent}),\mathtt{CountryC}) :- \\ \quad \mathtt{context}(\mathtt{CountryA}),\mathtt{context}(\mathtt{CountryB}),\ \mathtt{home\_country}(\mathtt{Parent},\mathtt{CountryB}), \\ \quad [\mathtt{CountryB}]\mathtt{jurisd}(\mathtt{heir}(\mathtt{A},\mathtt{B}),\mathtt{CountryC})).\end{array}$$

The determination tool may point out that we have to decide the validity of the matter in a different jurisdiction with respect to the current one. In rule (A) the jurisdiction for the matter $\mathtt{heir}(\mathtt{Child},\mathtt{Parent})$ is determined as the country of the parent (`CountryB`), which may be different from the current jurisdiction (`CountryA`). In such a case, we need again to decide the jurisdiction according to the private international law in the new country (i.e., `CountryB`). This is called a "renvoi". If a loop in the "renvoi" is detected, the jurisdiction is set to the starting country of the loop. For example, if the private international laws determines the following sequence of jurisdictions A, B, C, D, B, then we can decide the jurisdiction for the matter to be country B.

In order to deal with such a kind of loop in renvoi, we introduce the following general rule: $(R)\ \Box[\mathtt{CountryA}]\Box[\mathtt{CountryA}](\mathtt{jurisd}(\mathtt{Matter},\mathtt{CountryA}) :- \top.$

For instance, when applying rule (A) in case $\texttt{home\_country}(\texttt{Parent}, \texttt{CountryA})$ holds, the second subgoal in the body of (A), i.e., $[\texttt{CountryB}]\texttt{jurisd}(\texttt{heir}(\texttt{A}, \texttt{B}), \texttt{CountryC})$, immediately succeeds with $\texttt{CountryB} = \texttt{CountryA}$, letting $\texttt{CountryC} = \texttt{CountryA}$, as the home country of the Parent is precisely $\texttt{CountryA}$, the country in which the determination of jurisdiction was issued.

To avoid other, spurious jurisdictions to be found, a "cut" should be added in the body of rule (R), although, of course, this is a feature which cannot be captured by rule-based language above. In [9] an encoding of cut by means of and announce predicate and an integrity constraint is exemplified, based on a notion of *global abduction*. To capture the correct behavior of renvoi, avoiding spurious solutions, an extension of the formalism with abduction or with some form of default negation would be needed. This will be subject of further work.

4. Conclusions and related work

Dung and Sartor in [4] provide a logical model of private international law, based on modular argumentation, as a way of coordinating the different normative systems without imposing a hierarchical order on them. They do not consider the issue of modeling chains of references. In this paper we exploit a rule based fragment of a modal logic with agent (or context) modalities, a simplified notion of common knowledge and context variables to capture renvoi (i.e., chains of references). As we have already mentioned above, our language is monotonic. Modeling private international law in its full generality might require a combination of both nonmonotonicity and modularity (see [4] and [7]). This motivates a nonmonotonic extension of the proposed rule-based formalism, that will be considered for future work.

The formalism we have considered is clearly related with other formalisms for dealing with multi-agent systems in computational logic and in Answer Set Programming (we refer to [5] for a survey).

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